

REMARKS

Summary of Amendments and Status of Claims

Claims 1-11 have been canceled.

Claims 12 and 17 have been amended to address the claim objections made in the June 2, 2009 Office action.

Claim 12 has further been amended to more particularly point out and distinctly claim the present invention, while claims 17 and 18 have been revised to accord with the amendments to claim 12. Paragraph [0075] under Embodiment Mode 6 provides particular support for these amendments.

Claims 22-27 were previously withdrawn.

Meanwhile, new claims 28-31, each depending directly from claim 12, have been added. Support for claims 28-30 can be found in paragraph [0115] of the specification as filed, while support for claim 31 can be found in the entry for Implementation 32 in Table X of the specification.

- **Independent claim 12 and its dependent claims 13-21 and 28-31 are currently pending.**

Claim Objections

Claims 12-21 were objected to for the claim 12 recitation, "a step of separating from said starting substrate Group III nitride semiconductor crystals"

Although the Office kindly suggested rephrasing this recitation to read that the starting substrate is separated from the crystal, throughout the present specification the reverse is stated: namely, that the crystal (made up of the crystal substrate and the device-forming crystal layer grown on the substrate) is separated from the starting substrate. Moreover, the term "crystal" has been amended to recite clearly what it actually has become here—i.e., a device.

Accordingly, Applicant has chosen to amend the objected-to phrase, which appears in both claim 12 and claim 17, by inserting separating commas to make the phrase read more clearly, as follows, wherein the term "crystals" has been replaced by "devices": "a step of separating₁ from said starting substrate₂ Group III nitride semiconductor devices"

It is earnestly urged that appropriate correction as required has been made.

Claim Rejections – 35 U.S.C. § 112

Claims 12-21 were rejected for indefiniteness because certain recitations in claim 12 were read as lacking sufficient antecedent basis, with claims 13-21 inheriting the alleged deficiencies.

Claim 12 recites, in part:

a step of growing at least two Group III nitride semiconductor crystal substrates . . . ;
a step of growing at least one device-forming Group III nitride semiconductor crystal layer on each said Group III nitride semiconductor crystal substrate; and
a step of separating . . . Group III nitride semiconductor devices that are constituted by said Group III nitride semiconductor crystal substrates and said Group III nitride semiconductor crystal layers.

Abbreviating the recitations based on the underlined portions in the foregoing section quoted from claim 12 gives:

growing at least two substrates;
growing at least one layer on each said substrate; and
separating devices constituted by said substrates and said layers.

Hence, it is respectfully submitted that i) there is in fact proper antecedent basis for reciting "each said . . . substrate" in line 6 of claim 12; ii) there is in fact proper antecedent basis for reciting "said . . . substrates" in line 8 of claim 12; and iii) there is in fact proper antecedent basis for reciting "said . . . layers" in line 9 of claim 12.

Therefore, it is believed that the rejection under this section is not proper and should be withdrawn.

Claim Rejections – 35 U.S.C. § 102

Claims 1-10 and 12-21 stand rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Pat. No. 6,617,261 to Wong et al.

Claims 1-10 have been canceled.

Wong et al., column 10, lines 21-26, states,

Removal of the insulating sapphire substrate from the grown GaN substrate simplifies providing electrical contacts to the resulting GaN substrate for nitride based semiconductor laser structures subsequently grown on the GaN substrate.

Thus, a GaN substrate is grown onto a sapphire substrate as a starting substrate, and then a nitride-based semiconductor laser structure is built onto the GaN substrate having been separated from the sapphire substrate.

In contrast, according to the present invention as set forth in the pending claims, after at least two III-nitride semiconductor crystal substrates are formed onto a starting substrate, at least one device-forming III-nitride semiconductor crystal layer is grown onto each III-nitride substrate, without separating the III-nitride substrates from the starting substrate, and afterwards the III-nitride substrates, together with the III-nitride layers formed onto the III-nitride substrates—that is, the formed III nitride semiconductor devices—are separated from the starting substrate.

Paragraph [0075] of the present specification begins the description of Embodiment Mode 6 by stating that the method of the invention:

includes a process of growing . . . substrates . . . , a process of growing . . . crystal layers on the . . . substrate(s) . . . , and a process of separating the . . . crystal, which is constituted by the . . . substrate(s) and the . . . layer(s), from the starting substrate The method produces a Group III nitride semiconductor device.

(Reference numerals omitted; emphasis added.) The foregoing characterization of the present invention is clearly set forth in claim 12 as amended, and in particular provides support for the claim 12 recitation of

a step of growing at least one device-forming . . . crystal layer on each . . . substrate; and a step of separating, from said starting substrate, . . . III nitride semiconductor devices . . . constituted by said . . . substrates and said device-forming . . . layers.

It is respectfully submitted that the manufacturing potential of forming, in the manner of the present invention, nitride device-forming layers onto a GaN substrate with the starting substrate still attached clearly is superior to forming, as in *Wong et al.*, nitride layers onto a GaN substrate once having been separated from the starting substrate.

With *Wong et al.*, after GaN crystal has been grown onto a sapphire substrate, as set forth in column 5, line 34 through column 7, line 30 of the reference, the following sequence of operations is carried out:

mask layer is deposited on GaN layer → mask layer is patterned → GaN layer is etched through mask layer, creating individual GaN substrates → GaN substrates are bonded to silicon support substrate → GaN substrates are separated from sapphire substrate → GaN substrates are released from support substrate.

Thereafter, epitaxial growth is carried out.

In contrast, according to the present invention as recited in the pending claims, and as set forth under Embodying Mode 6 in the description section of the present

specification, there are no steps that involve bonding III-nitride substrates onto, and releasing them from, a support substrate.

On the continuation sheet appended to the October 20, 2009 advisory-action report, the Examiner kindly addressed Applicant's foregoing assertion, by noting that these remarks are directed specifically to the initially described embodiment in *Wong et al.*, while the § 102 rejection in the June 2, 2009 action relies on the *Wong et al.* embodiment illustrated in Fig. 9-14 and described in the corresponding portion of the reference. The Examiner concludes by stating that this latter *Wong et al.* embodiment, "clearly discloses growing Group-III semiconductor substrates instead of bonding that the Applicant is arguing."

Yet this assertion misses the point of Applicant's argument; the point is not simply that a method according to the present invention does not involve bonding III-nitride substrates onto, and releasing them from, a support substrate. As stated above, according to the present invention,

after at least two III-nitride semiconductor crystal substrates are formed onto a starting substrate, at least one device-forming III-nitride semiconductor crystal layer is grown onto each III-nitride substrate, without separating the III-nitride substrates from the starting substrate.

Moreover, in the Fig. 9-14 embodiment of *Wong et al.*, described in column 7, line 36 through column 9, line 13 thereof, the second (re-grown) GaN layers 216 form "substrate templates 218," as termed in column 8, line 27. These substrates 218—as they are thereafter simply referred to—incorporate the GaN nucleation layer 202 and the GaN layer 204. As illustrated in *Wong et al.* Fig. 13, "the upper surfaces 222 of the GaN substrates 218 are bonded to a silicon (Si) support substrate 224 using an adhesive bond 226." (Column 8, lines 43 and 44; emphasis added.)

Most significant, the description of the Fig. 9-14 embodiment of *Wong et al.* clearly states that the substrates grown in that embodiment are separated from the support substrate prior to formation of any device-forming layers on the substrates. Column 9, lines 6-13 state:

As seen in Fig. 15, the GaN substrates/support substrate structure is immersed in an organic solvent 240 to release the GaN substrates 218 from the support substrate 224. The GaN substrates 218 are then cleaned by standard wafer-cleaning processes to prepare the substrates for deposition of subsequent nitride based semiconductor layers to form semiconductor structures.

(Emphasis added.) The fact that the *Wong et al.* substrates going into device-forming deposition are by design released from their support substrate is clearly foreshadowed by the *Wong et al.* passage in column 8, lines 7-10, which states, "The openings form the sections of the second subsequently re-grown GaN layer which will later be separated from the sapphire substrate to form the GaN substrates of the present invention," and the phrase in column 9, lines 1 and 2, which notes that the

laser lift-off process just described results in the "separation of the GaN substrates from the sapphire substrate."

Thus the thrust of the entire *Wong et al.* embodiment illustrated in Fig. 9-14 and described in column 7, line 36 through column 9, line 13 is toward preparation of GaN substrates prior to device formation, as is conventionally the case. In contrast, according to a method of the present invention as set forth in claim 12, at least one device-forming III-nitride semiconductor crystal layer is grown onto each III-nitride substrate, without separating the III-nitride substrates from the starting substrate.

Inasmuch as claim 12 is believed to be patentably distinct from *Wong et al.* at least for the foregoing reasons, claims 13-21, which each depend directly or indirectly from claim 12, are also believed to be patentable.

Claim Rejections – 35 U.S.C. § 103

Claims 10 and 21: Wong et al. '261 in view of Tsuda et al. '957

Claims 10 and 21 were rejected as being unpatentable over *Wong et al.* in view of U.S. Pat. App. Pub. No. 2003-0136957 in the name of Tsuda et al.

Inasmuch as the patentability of the present application is not believed to reside only in the limitations recited in claims 10 and 21, but in the first place, in the limitations of their parent claim 12, it is respectfully submitted that these dependent claims should be held allowable as depending from a base claim 12 that is allowable for the reasons set forth above in addressing the rejection of claim 12 under 35 U.S.C. § 102.

Conclusion

Accordingly, Applicant courteously urges that this application is in condition for allowance. Reconsideration and withdrawal of the rejections is requested. Favorable action by the Examiner at an early date is solicited.

Furthermore, rejoinder of the withdrawn claims—as a matter of right as properly depending from, by containing all of the limitations of, an allowable parent claim and any intervening dependent claims—is also earnestly solicited.

Respectfully submitted,

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